

Preparation Strategies in Percussion
for the Music of J. S. Bach, Joseph Schwantner, and Iannis Xenakis

BY

©2014
Mai Tadokoro

Submitted to the graduate degree program in Music and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Musical Arts.

Chairperson Dr. Roberta Schwartz

Prof. Ji Hye Jung

Dr. Kip Haaheim

Prof. Scott Watson

Dr. Maggie Childs

Date Defended: Dec. 9, 2014

The Thesis Committee for Mai Tadokoro
certifies that this is the approved version of the following thesis:

Preparation Strategies in Percussion
for the Music of J. S. Bach, Joseph Schwantner, and Iannis Xenakis

Chairperson Dr. Roberta Schwartz

Date approved: Dec. 17, 2014

Abstract

In order to reach an optimal performance level, it is important that performers fully understand the music being presented; be technically, physically, and mentally ready to perform; and be content and satisfied with themselves. Appropriate preparation will help a performer to advance the performance quality and efficiency, develop musicianship and confidence, and achieve an optimal performance even under pressure. For technical and physical preparation, it is important to incorporate multiple senses when practicing while having specific practice goals in mind. The mental side of practice includes developing trust, devising coping skills for performance anxiety, and understanding the purpose of performing as an opportunity to share with an audience rather than focusing on making no mistakes.

The Allemande from *Cello Suite No.5* by J. S. Bach challenges the performer's sensitivity to clearly enunciate nuances in the music. It is also difficult to play cello music on the marimba because of the different nature of resonance. Harmonic analysis and listening skills in hearing important chord progressions, chord functions, voice leading, etc. should be the main focus for learning tonal music.

Velocities by Joseph Schwantner (a contemporary marimba solo) presents physical and mental demand. Slow kinesthetic-based practice is necessary to develop a refined muscle memory. Cognitive-based practice, such as making a mental map, visualization, and anticipation will help to develop conscious explicit memory, which in turn helps retrieving the automated memory. Players can add an exercise regimen to develop physical strength, control, endurance and flexibility.

For *Psappha* by Iannis Xenakis (a multiple percussion solo), performers need to find their own instruments and setup, manage unfamiliar grid notation, and conceive a proper interpretation. Analysis of the music takes a primary role in understanding the piece. The author suggests rewriting the notation by assigning a syllable to each sound, and practice by chanting it. This helps to free the players from reliance on muscle memory, allows them to practice without the actual instruments, and enhances player's musical intuition.

Acknowledgements

My sincerest appreciation goes to my committee chair, Dr. Roberta Schwartz, and my percussion instructor, Professor Ji Hye Jung for their guidance and encouragement. I would also like to thank my other committee members, Dr. Kip Haaheim, Prof. Scott Watson, and Dr. Maggie Childs for their time and advice. I wish to thank Eric Hessel for assisting with my writing and his encouragement throughout the process. Additionally, I am very grateful to my friends and peers for their constant support during my education in the University of Kansas. Finally, I want to thank my family for their unfailing love. Without everyone's help and assistance, I could not have completed this project.

Table of Contents

Title Page	i
Acceptance Page	ii
Abstract	iii
Acknowledgements	v
Table of Contents	vi
Introduction	1
Chapter 1: Performance Preparation Steps	3
Chapter 2: Allemande from <i>Cello Suite No.5</i> by J. S. Bach	15
Chapter 3: <i>Velocities</i> by Joseph Schwantner	25
Chapter 4: <i>Psappha</i> by Iannis Xenakis	36
Conclusion	51
Bibliography	53

Introduction

Performing at the highest level under pressure is a challenge for many musicians. The root of the issue for many musicians, especially young players, is the lack of proper preparation, both physically and mentally. Better preparation strategies not only advance performance quality and efficiency of the learning process, but also enhance the performer's musicianship and creativity. Thus, I will examine the percussionist's perspective on performance preparation strategies for optimal performances while under pressure.

The ultimate goal of preparing any music is sharing all of the meaning of that music directly with the audience. However, too often the performer is overcome with nerves for the performance, imagining that he or she might miss notes and thus destroy the effect of the piece. This is a sign of improper mental preparation. Working on both mental and physical preparation, and having the right balance between the two, will ideally allow the performer to play accurately, but more so to convey the meaning of the music convincingly despite an occasional mistake.

In the first chapter of the paper, I will analyze challenges of performance from both physical and mental perspectives, and introduce general preparedness approaches that apply the practice strategies used by athletes to the performance preparation process. These can be a great benefit for percussionists, as percussion playing is similar to sports in physical demand and requirement of mental discipline. The rest of the chapters will be a discussion of preparation strategies for three contrasting musical works: the "Allemande" from *Cello Suite No. 5* by J. S. Bach, a tonal piece arranged for marimba; *Velocities* by Joseph Schwantner, a contemporary marimba piece; and *Psappha* by Iannis Xanakis, a multiple percussion piece with grid notation.

These three works highlight the most challenging and stressful aspects of percussion performance.

Playing my best under pressure has been the biggest challenge for me as a performer, and it was one of the aspects I have worked to improve in my studies at the University of Kansas. It is still an ongoing process, but I would like to share the knowledge I have obtained while developing this set of skills for the benefit of other musicians, students and educators, and show how they might be used as pedagogical tools. With appropriate preparation, a performer will learn techniques necessary to mastering the music confidently. Only after this point will the performer understand why the pressure of presenting that music in the spotlight is alleviated by the preparation he or she has given it.

Chapter 1: Performance Preparation Steps

In order to reach an optimal performance level, it is important that performers fully understand the music being presented; be technically, physically, and mentally ready to perform; and be content and satisfied with themselves. However, there are many challenges that interfere with the performers' journey to the stage. Identifying and understanding these difficulties will help the performers envision better preparation strategies.

Identify the challenges

For percussionists, one of the biggest challenges is embracing the diversity of instruments, techniques, and styles necessitated by their repertoire. They are required to learn numerous numbers of instruments, from pitched (marimba, timpani, etc.) to non-pitched (drums, cymbals, etc.) to unconventional (pipes, pots, etc.) and styles of music from the classical, contemporary, jazz, popular, and ethnic idioms. Each instrument and musical style requires a different learning process. Knowing the different instruments and styles are essential in college auditions and large ensemble auditions, in which the percussionists must be proficient in at least snare drum, timpani, and keyboard instruments for both two and four mallets.

Physical demand is another challenge. Percussion instruments can be big or heavy, and percussionists need to be physically in shape and have a good control of all four limbs. Physical demands sometimes require performers to memorize the music, due to both the inability to turn pages and the necessity of visually reinforcing what pitches or instruments need to be struck at a given time. A lot of physical demands, especially on larger instruments and setups, stems from playing accurately and creating the best sound, even if this means memorizing the music.

The constant learning process for new styles and techniques is another challenge. The breadth of percussion repertoire is expanding rapidly, and composers constantly introduce new and innovative ideas. When learning new music, percussionists need to understand a composer's particular language and notation system, and develop extended techniques, such as bowing, playing wind instruments (whistles, conch shells, didgeridoo), or singing/speaking while playing. Percussionists need to be flexible and adapt to these new styles and techniques.

In regards to mental perspective, the biggest challenge is overcoming nerves. There are many possible factors that make performers nervous, such as self-doubt, fear of making mistakes, high expectations, over-analysis of technique, and lack of sufficient time for preparation. Nervousness can cause performers to lose focus, become distracted, and can even create physical symptoms, such as shaking, rising heart- rate, muscle tension, shortness of breath, perspiration, and feeling nauseated.¹ If these problems are not addressed properly, performers may develop unbearable performance anxiety.

Practice strategies

Researchers have observed that effective practice strategies are better predictors of performance quality than the quantity of time spent in practice.² Spending a great amount of time on a piece will not necessarily yield a better performance. In fact, short, focused practice sessions are often the most productive.³ Many performers rely on simple repetition of a skill or entire

¹ Kathleen Curtis, A. *Physical Therapy Professional Foundations: Keys to Success in School and Career*. (NJ: Slack, 2002), 97.

² L. M. Gruson, "Rehearsal skill and musical competence: Does practice make perfect?" in *Generative processes in music: The psychology of performance, improvisation and composition*, ed. J. A. Sloboda (Oxford: Clarendon, 1988), 91-112.

³ Andreas C. Lehmann and K. Anders Ericsson, "Research on Expert Performance and Deliberate Practice: Implications for the Education of Amateur Musicians and Music Students," *Psychomusicology: A Journal of Research in Music Cognition* 16, no. 1-2 (1997). 40-58.

piece as a primary practice strategy; yet, when practicing, it is more important to have a clear goal.

Don Morgan, an expert in psychotherapy and health business, suggests SMART goals: Specific, Measurable, Achievable, Realistic, and completed within a specified Time.⁴ These goals can be applied to percussionists. For example, a performer might choose to devote a practice session to only one aspect of a piece, perhaps only rhythm or only note accuracy. In a session devoted to rhythm, he or she could remove the pitch aspect altogether by playing through a marimba piece on snare drum; achieving rhythmic integrity first is a more manageable goal than trying to perfect all aspects of a piece at the same time. Strategies like this will be discussed further below. The most important idea to distill from Morgan's system is identifying specific learning goals and knowing which skills or sections need to be addressed during a practice session. Percussionists often try to focus on all of the skills required of them, but because of the great number of skills and instruments involved, this approach is not practical for any given day. Proficient musicians also effectively employ metacognitive skills like planning, self-monitoring, and self-assessment in learning progress.⁵ These are applied constantly throughout a practice session, as well as before and after.

Deconstruction and Reconstruction

The performer's job is to transform the composer's musical ideas by deconstructing the music through score study and reconstructing it with a new understanding of the work. A deep understanding of the music is essential for the process. Knowing the piece not only helps the

⁴ Don Morgan, "Subconscious and *Smart*conscious Goals," in *Masters of Success: Proven Techniques for Achieving Success in Business and Life*, ed. Ivan R. Misner and Don Morgan (Toronto, Canada: Entrepreneur Press, 2004), 98

⁵ Rebekah Jordan-Miller. "Mental Skills Training For A Lower-Advanced To Advanced Pianist" (DMA diss., University of Oklahoma, 2010), 39.

players to emotionally connect to the music, but also allows the performers to find the proper approach to nuances in form, pitch, rhythm, etc. Each composer uses his or her own musical language. An inappropriate interpretation may ruin the whole aesthetic of the music.⁶ Any information will help the performers to have clear mental images and musical goals, and to convey them with more conviction to the listener.⁷

The process of studying the music involves researching the composer's biography and musical style, the historical and compositional background of the piece and the composer's intention; listening to preexisting recordings; and studying both formal and harmonic structures in the music. After studying the music and digesting its meaning, performers need to reconstruct the music with their own interpretation, intuition, and creativity, within the proper stylistic limitations.⁸

Technical preparation

For the technical side of preparation, it is important to develop skills that can be flexible and adaptable to any instrument, style, or situation. In order to develop these skills, it is important to incorporate as many senses as possible when learning music: auditory, visual, and kinesthetic, cognitive, and emotional. These are sometimes divided into left-brain and right-brain,⁹ or analytical vs global.¹⁰ Using all senses will allow the performers to become well-balanced musicians. It will also help them to be more flexible when the music lacks a sense of meter, harmony, etc., or when internal (anxiety) or external issues (lighting, noise) of the

⁶ Peter Walls "Historical Performance and the modern performer" in *Musical Performance: A Guide to Understanding* (Cambridge: Cambridge University Press, 2002), 17-34.

⁷ Jeannine W. Hamburg, *Where Is That Music Coming From? : A Path to Creativity*, 1st ed. (Cherry Hill, NJ: Myrte Press, 1989). 30.

⁸ John Rink "Analysis and (or?) Performance" in *Musical Performance : A Guide to Understanding* (Cambridge; New York: Cambridge University Press, 2002), 35-58.

⁹ Hamburg, *Where is that music coming from?*, 9-10.

¹⁰ Barry Green and W. Timothy Gallwey, *The Inner Game of Music*, 1st ed. (Garden City, N.Y.: Anchor Press/Doubleday, 1986). 176-188.

performance distract them from the particular sense upon which they usually rely. Every player has different learning styles and strengths. It is important that the players know their tendencies and not be unbalanced when learning music.¹¹ The following chart includes examples of different ways of practice using each sense.

Example 1.1	
Auditory-based practice:	<ul style="list-style-type: none"> ▪ Listen to recordings and be familiar with the melody and harmony ▪ Pay attention to harmonic progressions, counter points, and cadence points while playing ▪ Pay attention to voicing, balance, and dynamics ▪ Practice singing the melody and intervals
Visual-based practice:	<ul style="list-style-type: none"> ▪ Practice reading ahead of the music and targeting spots before playing ▪ Have an image of the music, chords and angle/shape of mallets
Kinesthetic-based practice:	<ul style="list-style-type: none"> ▪ Have multiple slow repetitions of body movement ▪ Develop refined autopilot for difficult passages
Cognitive-based practice:	<ul style="list-style-type: none"> ▪ Make a mental map (structure, chord progression, character change etc.) ▪ Think ahead while playing and get ready for upcoming sections ▪ Practice without using instruments (visualize playing) ▪ Visualize scenery, color, or character of the music and mimic the vision in playing
Emotional-based practice:	<ul style="list-style-type: none"> ▪ Feel the emotional content of the music ▪ Make storyline using imagination ▪ Let emotion and intuition lead without having technical thoughts

Examples of practicing by connecting senses include: developing the association of resulting sound with the name of the notes or chords and “feeling” of the result (audible, cognitive, and emotion); combining structural cues and emotional cues in a mental map (cognitive and emotion); using body movement to convey the character of the piece (kinesthetic

¹¹ Ayano Kataoka interview (by the author) November 18. 2013.

and emotion); and practicing by blocking chords for fast passages (visual, audible, and kinesthetic).

When practicing kinesthetically, it is effective to incorporate both conscious and subconscious practice. Conscious practice includes thinking of body posture, height, angle, and velocity of the mallets or sticks, body movement, timing, and sound quality while repeating the same passage slowly. This type of practice is helpful for improving note or rhythm accuracy and developing a refined autopilot. Subconscious practice includes repeating the same passage without thinking anything by only counting the numbers of repetition. This practice will develop the skills of being mindful, letting go of mistakes or any judgmental thoughts, and allowing the body to learn things naturally. This methodology comes directly from athletic practice. Youichi Kozuma describes this process in relation to a basketball player developing accurate shooting skills. Another subconscious practice is starting from variety of places in the music without taking time, or practice playing a small section of music without stopping in the middle. It is even better to incorporate some distractions, such as using a recorder or external noises. This will help the player to be able to focus, and subconsciously execute trained muscle movements without overanalyzing the technique, though this particular practice works only after developing fine motor skills.¹²

When working to memorize music, it is important to understand different types of long term memory: explicit (declarative) and implicit (non-declarative). Explicit memory involves conscious recollection of things and facts that can be verbally recalled. Implicit memory is recalled automatically without conscious effort. This is what we call motor memory, muscle

¹² Youichi Kozuma. *Mental training for basketball players* (Tokyo: Bassball Magazine Japan, 2010), 107-109.

memory and kinesthetic memory.¹³ Motor memory is essential to the musical learning process: however, it can easily break under pressure. This phenomenon is called choking in sports psychology. Choking happens when people pay too much attention to the automated or routinized motion.¹⁴

For skilled athletes, automatic processing usually produces their best performance. However, in high-pressure situations these athletes are sometimes guilty of “thinking too much” and trying to control their movements in a conscious fashion (using controlled processing).¹⁵

It is important to reinforce both types of memory when practicing. Implicit memory can be developed using the kinesthetic-based practice described above. Cognitive-based practice, such as making a mental map, knowing key changes and harmonic/chord progression, and practicing without using instruments helps for developing explicit memory, which in turn helps to retrieve the automated memory. Schmidt suggests that motor patterns or movement sequences need to be cognitively controlled so that pre-programmed mental commands in the form of generalized motor patterns can be retrieved from memory and executed when required without any interference or input from sensory information.¹⁶ Moore states that “retrieving a motor program from memory is a skill in and of itself.”¹⁷ This memory retrieval can be strengthened by practicing longer sections of a piece without stopping. However, this type of practice requires a lot of focus and concentration. Limiting the number of repetitions is more efficient for this particular practice.

¹³ Richard A. Schmidt and Craig A. Wrisberg. *Motor learning and performance: a situation-based learning approach*, 4th ed. (Champaign, IL: Human Kinetics, 2008), 109-111.

¹⁴ Stevens, and Shirley McKechnie. *Thinking in four dimensions: creativity and cognition in contemporary dance*. (Carlton, Vic.: Melbourne University Press, 2005), 52.

¹⁵ Schmidt and Craig, *Motor learning and performance*, 56.

¹⁶ Richard A. Schmidt, “Control Processes in Motor Skills,” *Exercise and Sport Science Reviews* 4 (1976):229-261.

¹⁷ Bill Moore, *Playing Your Best When It Counts: Mental Skills for Musicians* (Oklahoma: Moore PerformanceConsulting, 2011), 69.

Physical preparation

Developing muscle and taking care of physical health is essential for percussionists in the same way that runners cannot complete a marathon without a constant development of physical endurance. Too much physically intensive practice without enough strength may lead to injury. Organizing the practice schedule by shifting from physical to mental practice is helpful. It is also important that the players take time to warm up, stretch and massage before, after, and between practice times. Performers are required to discipline their body to achieve the peak physical condition at the time of the real performance.

Physical exercise or sports are effective not only for developing muscle and endurance, but also for reducing anxiety and depression.¹⁸ Exercises that incorporate rhythmic abdominal breathing, such as hatha yoga, tai chi, walking, running, riding a bicycle, and swimming, are beneficial for enhancing mood. The physiological benefits of exercise include an increase of cerebral blood flow with maximal oxygen consumption and delivery to cerebral tissues, an improvement in brain neurotransmitters, and a reduction of muscle tension.¹⁹ These benefits also help to increase energy and mental alertness, release stress, and develop self-confidence and emotional stability.²⁰ Physical activity also has practical connections to musical skills. James VanDemark, double bass professor of Eastman School of Music, requires a boxing regimen in order for his students to develop skills in rhythm, creativity and improvisation, and to establish stage presence and strong discipline of good practice habits.²¹

¹⁸ Sy A. Saeed, Diana J. Antonacci and Richard M. Bloch. "Exercise, Yoga, and Meditation for Depressive and Anxiety Disorders." *American Family Physician* 81, no. 8 (2010): 981-986.

¹⁹ Robert S. Weinberg and Daniel Gould, *Foundations of Sport and Exercise Psychology*, 4th ed. (Champaign, IL: Human Kinetics, 2007). 398-404.

²⁰ Robert J. Kriegel and Marilyn Harris Kriegel, *The C Zone : Peak Performance under Pressure*, 1st ed. (Garden City, N.Y.: Anchor Press/Doubleday, 1984). 116-118.

²¹ "Brawl in the Concert Hall," *ESPN* video, 4:24 P.M., October 31, 2014, <http://espn.go.com/video/clip?id=11798208>

Mental preparation

Dr. Bill Moore, performance psychology specialist, suggests that “trust” is the most essential mental skill that is necessary for reaching high-level performance.²² In order to reach to the stage, performers need to realize that there are two parallel routes: the endless process of developing and refining physical, technical, and musical skills, and the ability to trust those skills during performances. Moore defines trust as “letting go of conscious controlling tendencies learned during skill acquisition and allowing the automatic processes, which have been developed through training, to run without interference.”²³ This position reinforces the ideas of implicit and explicit memory, discussed above. To illustrate further, Tim Gallwey, author of *Inner Game of Tennis*, suggests a way of developing the skill of letting go by identifying the conscious mind as Self-1 (thinker/self-instructor) and subconscious mind as Self-2 (doer/motor control system), respectively, and by simply quieting Self-1 and trusting Self-2 to allow natural learning processes.²⁴ One common mistake is that players wait until they become good enough before they can trust their trained skills. This is most likely unrealistic, since the musical learning process is endless. Moore states that “trusting what you *currently* have, although difficult and often scary, is your mental performance goal.”²⁵

Letting go of conscious control and quieting the mind begins with the practice of acceptance and non-judgmental thinking. Acceptance involves embracing the imperfect self and situation,²⁶ as well as the internal and external interferences; in other words, changing the

²² Moore, *Playing your best when it counts*, 32.

²³ Ibid., 51.

²⁴ W. Timothy Gallwey, *The Inner Game of Tennis*, Rev. ed. (New York: Random House, 1997).33-49.

²⁵ Moore, *Playing your best when it counts*, 50.

²⁶ Maria Hunt and Shirlene Hess, *Avila University's Mindful Wellness Self-Study Workbook* (Kansas City: Avila University, 2011), 48.

mindset to “allowing” all possibilities rather than “fighting” the less-desirable outcomes.²⁷ Non-judgmental thinking involves observing facts without categorizing them into right and wrong, or good and bad.²⁸

Managing attentional focus and creating a positive mindset will help players in handling nerves. Eliminating anxiety altogether is extremely difficult, and it does not necessarily help for optimal performance. Feeling nervous is a completely natural response. Eminent musicians and athletes simply know how to deal with it by shifting their attentional focus or using the nerves for positive energy.²⁹ Proper performance management necessitates shifting the focus to the actual process rather than the result³⁰ and maintaining a strong connection to the aspects that are controllable.³¹ Creating a positive mindset involves visualizing a calm and confident self, developing and implementing a game plan, reframing performance threats (converting fear into excitement), and utilizing performance-based affirmation as a positive reminder or a refocus instruction.³² Some physical techniques, such as progressive relaxation technique (tensing and relaxing specific muscles), breath control, and meditation (tied to relaxation and self-awareness) will help to keep physical symptoms under control.³³

Clinical psychologist Susan Raeburn gives four general recommendations to college music students.

²⁷ Green and Gallwey, *The Inner Game of Music*. 117.

²⁸ Hunt and Hess Mindful Wellness Self-Study Workbook 31-32

²⁹ Moore, *Playing your best when it counts*, 123-146.

³⁰ Ken Ravizza and Tom Hanson, *Heads-up Baseball : Playing the Game One Pitch at a Time* (Indianapolis: Masters Press, 1995). 27.

³¹ Green and Gallwey, *The Inner Game of Music*, 82-101.

³² Moore, *Playing your best when it counts*, 143-146.

³³ A. D. Khasky and J. C. Smith, “Stress, Relaxation States, and Creativity, “ *Perceptual and Motor Skills* 88, no.2 (1999): 409-416.

- Be aware that rejection, loss, and competition are inherent in life, and especially so in music careers. Try not get caught up with comparisons. You do not have to “prove” anything. You are sharing, not comparing
- Focus on the pleasure you derive from music-making. Remind yourself why you chose a music career
- Do not equate your self-esteem and others’ opinions of you with how you perform
- Seek help from teachers, counselors and resource guides if experiencing ongoing anxiety³⁴

Practicing performing in front of people is a great way for musicians to simulate the feeling of actual performance. Moore states that the biggest difference between athletes and musicians is the amount of time they spend playing (performing): “Athletes are players who practice while musicians are practicers who play...Most competitive athletes will have dozens of performance repetitions over the course of six months, while most musicians may have one or two.”³⁵ Creating the opportunity to perform for people before the actual performance is important. It is also beneficial to have practice run-throughs by recording or videotaping yourself.

Back to basics

It is always important to return to the basic meaning of performing. The ultimate goal of the performance is connecting to the audience by sharing music. The preparation processes help performers to foster self-confidence and develop a deep understanding of the music that they present. They are not meant as technical or protective fallbacks that focus on making no mistakes. Moore states that “focusing intently on not failing will usually result in the performance lacking musicality, detracting from enjoyment.”³⁶ Once performers have prepared they should be free from technical thoughts, and express themselves and have fun performing and sharing musical

³⁴ Amy Likar, "Performance Anxiety: A Resource Guide." *Flutist Quarterly - the Official Magazine of the National Flute Association* 34/3 (2009): 32-36.

³⁵ Moore, *Playing your best when it counts*, 1

³⁶ Moore, *Playing your best when it counts*, 138.

works. Joyce Castle, the Distinguished Professor of Voice at the University of Kansas, shared her opinion about performance during an interview:

You must love the music! If you love it, you will give it your greatest attention, concentration, and practice. Then the music will be “yours” and it will be something to share. The audience will see/hear that...Great music demands great concentration. It demands a great deal but it has gifts in its hands. It makes me complete and happy. To work and connect with other musicians, conductors, and composers is a pleasure. Music has the possibility to change lives – for the musician and for the audience. It can make the audience laugh, cry, think about something that they haven’t thought about for a long time... We share with the world in our music. We communicate. This is life on a higher level. It is a gift.³⁷

³⁷ Joyce Castle, interview (by the author), Jan.31, 2014.

Chapter 2: Allemande from *Cello Suite No.5* by J. S. Bach

About the composer

Johann Sebastian Bach (1685-1750) was a German organist and composer in the late Baroque period. He wrote effectively in almost all of the major styles, forms, and genres of his time. Though Bach did not write any operas, he wrote cantatas and passions that demonstrate his ability to write expressive dramatic music in operatic style. Bach wrote mostly organ pieces and sacred cantatas during his period in Weimar (1709-1747), solo and ensemble music in Cöthen (1717-1723), and religious music, concertos and chamber works in Leipzig (1723-1750). Bach studied the music of many of his contemporaries and predecessors, and assimilated all of the best features into his own writing. His works, namely fugues, sonatas, inventions, cantatas, etc. are often considered epitomes of formal and motivic design.

About the piece

The six cello suites (BWV 1007-1012) were written around 1720, during Bach's tenure in Cöthen, where he served Prince Leopold as a court music director. Prince Leopold's interest in chamber music encouraged Bach to write plenty of instrumental music. The Cothen period represents his dedication to instrumental works, including Sonatas and Partitas for Solo Violin, The *Well-Tempered Clavier* Book I, and the six *Brandenburg Concertos*.¹

Unlike Bach's violin sonatas, there are no surviving autograph manuscripts for the cello suites. The closest secondary source available are handwritten copies by Johann Peter Kellner

¹ Allen Winold, *Bach's Cello Suites : Analyses and Explorations*, 2 vols. (Bloomington: Indiana University Press, 2007). 2-4.

and Bach's second wife, Anna Magdalena.² The fifth cello Suite (BWV 1011) was also notably transcribed for lute. Bach added bass lines and some additional harmonies to movements of the fifth cello suite in his version for lute, BWV 995.³ The Bach's original manuscript of the lute transcription survives in the Royal Library of Belgium.⁴

The fifth cello suite is written in *scordatura* tuning, with the upper string of the cello tuned down a major second from A to G, which is known as Italian tuning. It is the latest example of cello *scordatura* from the Baroque period. The original notation indicates the upper string notes not by pitches but by the positions of the fingers that will produce them. Scordatura was commonly used during the period to offer novel timbres and alternative harmonic possibilities, extend the instrument's range, and facilitate the playing of certain chords more easily.⁵

Bach's cello suites are clear examples of Baroque suite form. Each consists of series of stylized dances: allemande, courante, sarabande, optional dances, and gigue. They are occasionally introduced by a Prelude. The movements of a suite contrasts in meter and tempo, but not in key or form, which is usually binary. The allemande (which means "German" in French) originated as a German court dance, and it has been included in suites from their earliest examples. It is usually in a slow to moderate tempo and quadruple or duple meter, with the emphasis on the downbeats and elaboration of upbeat figures. It usually has a polyphonic texture, while the individual voices share and contribute to a line of shorter note-values. An allemande has more intricate melodic and rhythmic content than the other dance movements. Two different types of allemandes were commonly written: processional dances and concert pieces. The

² Ibid., 9.

³ Ibid., 7.

⁴ Eric Soblin, *The Cello Suites* (Crows Nest, N.S.W.: Allen & Unwin, 2009). 194.

⁵ D. Boyden David et al., "Scordatura," *Grove Music Online*.

allemande from the fifth cello suite has characteristics of the concert allemande, which is more elaborate and slower than the dance allemande.⁶

Challenges of the piece

Percussionists find significant challenge in playing Bach's music in general. The majority of percussion solo repertoire has been composed in the last fifty years, and due to the necessity of learning multiple instruments, percussionists have relatively little experience with Baroque music, unless they have studied it in a different context. An intuitive approach for playing tonal music is easier for players who have grown up listening to and playing the same style of music; however, some percussionists lack that experience and need to rely heavily on an analytical approach to understand the music.

Another challenge is to play a piece written for cello—a legato bowed instrument—on marimba, a percussive struck instrument. The articulative process is vastly different between the two instruments. As the bars of a marimba must be struck and then allowed to ring, the resulting sound comprises a strong attack followed by immediate decay. Thus, the challenge of playing music written for a bowed instrument is in reproducing sounds and phrases that are sustained or crescendo within a few notes. The ability to sustain is especially crucial in playing a slow movement like an allemande. However, there are also some advantages, such as the ability to play chords without breaking them down or slowing down, and adding different timbres to the voices by varying the mallet choice.

Music by Bach is frequently accompanied by strong expectations from listeners, which creates additional pressures for the performer. The audience has likely already heard the piece (or at least some of Bach's music) and already has notions about how the piece will unfold. Also,

⁶ Winold, *Bach's Cello Suites : Analyses and Explorations*. 8, 35-36.

tonal music emphasizes melody and harmony; therefore, missing one note will have a huge effect on the aesthetic of the piece. Playing marimba without missing notes is a lifetime challenge for the percussionist. Developing note accuracy and mental strength is important, in addition to learning the music itself.

Analysis of the piece

For tonal pieces, it is important to think about the harmonic progression, key changes, cadences and major arrival points, as well as phrasing, voicing, pacing, and playing in the correct style. Harmonic and formal analyses play an important role in learning the piece.

The following examples show a Roman numeral analysis of the allemande and a reduction to its most important chords and bass progressions.

Example 2.1 – Roman numeral analysis

ALLEMANDE $\text{♩} = \text{ca. } 48-54$

Chord and melodic annotations (Roman numerals and figures):

- Measures 1-4: $\text{Cm: } f$, V , V^b , i
- Measure 4: IAC
- Measures 5-8: V , V^b/VI , VI
- Measures 9-12: V^b/V , iv , V , V^b/III
- Measures 13-16: $cresc.$, III , V^b , i , V^b/V , V , I
- Measures 17-20: i^b , V , I
- Measures 21-24: $\text{Cm: } f$, V , E^b , vi , II , V^b/V
- Measures 25-28: V^b , $(meno)$, IV^b , V^7 , I , f , ii^b
- Measures 29-32: V^7 , V , $\text{Cm } IV$, III , $cresc.$, V^b/III
- Measures 33-34: V^b , iv , V , (tr) , V^7 , f , $C: PAC$, $(allarg. sempre)$, f

Example 2.2 – Reduction of the analysis

The musical score is in bass clef and 3/4 time, spanning 36 measures. The harmonic analysis is as follows:

- Measures 1-11: i, V6 / Ab, V6 / f
- Measures 12-18: V6 / Eb, V6 / c, G: V / V, V, I
- Measures 19-27: c: V, cadence in Eb
- Measures 28-36: cadence in f, ii7, V7, echo, i

The allemande is in C minor and in binary form, with a repeat of each section. The first concludes with a perfect authentic cadence in G major. This harmony is immediately reinterpreted as a half cadence in C at the beginning of the second section, a harmonic shift that is consistent with the tonal scheme of binary form.

In the first half of the first section, the initial five measures establish C minor with an imperfect cadence at m. 5. Starting in m. 6, Bach uses a sequence of secondary dominant resolutions: V6/VI moving to VI (Ab) in m.7 is followed by V6/iv moving to iv (F) in m. 9. A two-measure long V65/III chord with an octave leap emphasizes the bass-note D, which finally resolves to III (Eb) at m. 13, but the resolution is only dyadic and much weaker than the previous secondary dominants. The next V6 to I figure happens only a half-bar later with the same dyadic arrival now occurring on the tonic (C). This sets up the very important V42/G chord at m.15 that is prolonged until the G major cadence at the end of the first section.

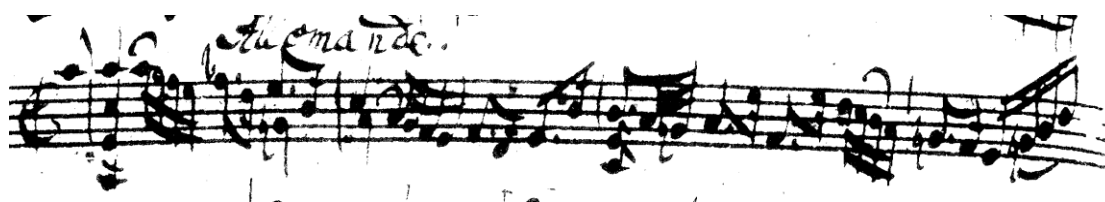
The second half commences on a G major chord, but the immediate occurrence of A-flat and F-natural implies that it is no longer a tonic chord, but rather, the dominant of C minor. Bach

immediately disrupts the resolution to C and starts a new progression at m. 22 that features a bass line moving downwards by step (Eb-D-C-Bb). This phrase cadences on Eb at m. 25. The rest on Eb major is again immediately broken by the Db bass note at m. 26 (emphasized by the large, downward leap), which directs the ear to the lowest C, with a V7/iv harmony that resolves at the end of the next measure. However, the resolution from E to F is weakened by the A natural that enters below the F in m. 29. While weakening the suggested cadence, this non-root A also has an important perfect fourth relationship with the bass D of the next measure. Starting with the D, another stepwise bass progression follows as D-(C)-B-Ab lead to G in the final dominant chord. Bach echoes with another Ab-G to emphasize the dominant chord before the final cadence on the tonic.

Stylistic interpretation

The excessive use of powerful dotted rhythms represents a resolute and vigorous character. One way to enhance the feeling is to incorporate the style with double-dotting characteristic of the French overture. In the lute edition (BMV 995), Bach actually changes the beginning pick up and the tied descending note value into smaller divisions (Example 2.4). This edition suggests the use of freer rhythmic execution. However, an opposite treatment, playing triplets instead of double-dotting does not represent the style.

Example 2.3 - Peter Kellner's manuscript for cello suite in C minor (BMV 1011)



Example 2.4 - Bach's manuscript for lute suite in G minor (BMV 995)



Practice strategy

This movement does not contain any fast passages that require much physical and technical proficiency; rather, it challenges performer's sensitivity to clearly enunciate nuances in the music. Bach did not indicate any of the dynamic or phrase markings; however, it is implied through his phrasing, and they emerge in the specific contexts. The skill of listening to the clues is important for playing Bach's music. In this piece particularly, the player's primary practice goal should focus on understanding the harmony and developing the listening skills needed to hear the chord progressions, the functions of each chord, voice leading, the subtle difference of each sound, and the connection of the notes. The player should be able to apply these listening skills to the particular sound of the instrument.

The tempo can be determined by finding a natural speed that allows expressive content of the movement with maximum effectiveness. Since the movement has solemn and austere character and is an elaborate concert allemande, slow tempos are appropriate. However, if it is

too slow, it will lose the sense of connection, especially when played on a percussive instrument. It is important to consider the decay of the marimba when choosing a tempo. The decay differs depending on the range of the bar, material of mallets, and the acoustics of the hall. Players are required to pay close attention to the resonance of the instruments and adjust the tempo depending on the situation.

The reduction analysis (Example 2.2) helps to identify phrasing, dynamics and general pacing of the piece. The reduction serves as a map that gives a clear direction to the movement. It shows the overall structure and important harmonic progressions. Usually, dominant chords are important to bring out following resolution and cadences; however, if the performer brings out every single resolution, the piece loses the sense of overall direction. Especially for the *allemande*, it is clear that Bach constantly avoids intermediate cadential punctuation to make the sections as continuous as possible. Knowing the hierarchy of each chord helps the performer to pace the climax of the piece more effectively.

Due to the lack of sustain, marimbists should consider different phrasing and dynamic options than those written for the cello. Although a roll can produce a fake sustention of the sound, it will have a sound quality similar to a string tremolo, which would not fit the solemn character required in this movement. Rolling is also very distracting to the audience visually, and can detract from the structural implications of the piece. Legato strokes and continuous motion, by contrast, can be a great visual reinforcement to the connection of the parts. The performer should consider foremost the structure of the piece in his or her phrasing, and allow the dynamics to better elaborate harmonies and changes despite the articulative disparity.

Developing note accuracy is important for playing Bach's music, as the harmony is the main focus of the music. If the performer decides to play by memory, note accuracy can be

improved by knowing the harmonic progression. Players miss notes not just because of physical execution problems, but partly because they do not know exactly what notes to hit. This problem is reinforced by the repetitive kinesthetic-based practice. Shifting to cognitive- based practice, such as playing only the chords to become familiar with the chord progression, or being familiar with the accidentals and their functional and diatonic implications, significantly reduces this problem. If the performer decides to play with music, they must work on refining kinesthetic motion, or in other words, knowing exactly how much arm extension reaching to the next note requires.

Listening to several recordings for both cello and marimba can help the performer to answer questions about performance practice or style, as well as to assimilate different ideas as part of their own interpretation. Ornamentation, for example, is a common feature of music of the Baroque period. Particularly in the repetition of each section, performers may take liberties and add trills or mordents on longer notes, or fill in leaps with scalar figures, etc. In a piece like the cello suite, the performer might even add slightly to the harmony; this ornamentation should be rare, and the performer might consider what additions would be possible for the cello. Helpful texts such as *The Interpretation of Early Music* by Robert Donnington⁷ and *Ornamentation in Baroque and Post-Baroque Music* by Frederick Neumann⁸ offer further elaboration on proper Baroque ornamentation. All of the changes, however, should in no way undermine the fluency or structure of the music. Generally, erring on the side of too little ornamentation is better than too much.

⁷ Robert Donnington, *The Interpretation of Early Music*, New rev. ed. (New York: Norton, 1992).

⁸ Frederick Neumann, *Ornamentation in Baroque and Post-Baroque Music : With Special Emphasis on J. S. Bach* (Princeton: Princeton University Press, 1978).

Chapter 3: *Velocities* by Joseph Schwantner

About the composer

Joseph Schwantner is an American composer born in Chicago, Illinois on March 22, 1943. He received his doctoral degree from Northwestern University, and served on the composition faculty at Eastman School of Music, Julliard School of Music, and Yale University.¹ Schwantner is famous for using unique timbres and textures in his composition. He writes in a variety of styles, including dodecaphonic pieces (*Consortium I*, 1970), tonal works (*Aftertones of Infinity*, 1978), and minimalistic pieces (*New Morning for the World: Daybrek of Freedom*, 1982).² In *Velocities*, Schwantner uses a series of pitch sets as a tonal center, rather than traditional functional tonality.³ He later used the same technique for the keyboard part of his *Concerto for Percussion and Orchestra* (1994). Both of these percussion works are influenced by minimalism, particularly in the repeated rhythmic and melodic figures.⁴

About the piece

Velocities (Moto Perpetuo) is one of the masterpieces of percussion literature written for solo marimba. *Velocities* was commissioned by the Percussive Arts Society with a National Endowment for the Arts Solo Marimba Commissioning Grant in 1986 and completed in August

¹ Joseph Schwantner, *Velocities (Moto Perpetuo)*, (NY: Helicon Music Corporation, 1991).

² Thomas Burritt, "John Serry's Rhapsody for Marimba, Night Rhapsody, and Joseph Schwantner's *Velocities*. A Performer's Analysis." (DMA diss., 1999), 81.

³ Schwantner, 3.

⁴ I-Jen Fang, "The 1986 National Endowment For The Arts Commission: An Introspective Analysis of Two Marimba Works, Reflections on The Nature of Water by Jacob Druckman and *Velocities* by Joseph Schwantner, Together with Three Recitals of Selected Works by Keiko Abe, Christopher Deane, Peter Klatzow, Wayne Siegel, Gitta Steiner, and Others" (DMA diss., University of North Texas, 2005), 20-24.

1990. It was written for marimbist Leigh Howard Stevens.⁵ Ever since it was commissioned, it has appeared in most marimba competitions as a test piece.

Analysis of the piece

Velocities is in a clear arch form, as shown below:

Example 3.1- form

Measures: 1-24	25-47	48-104	105-121	122-204	205-209	210-285	286-316	317-end
Sections: Intro	A	B	Trans.	C	Trans.	B'	A'	Coda

The whole piece has symmetrical figures. The introduction and extended coda are also composed using the same thematic material. The three thematic ideas from introduction are listed below:

Example 3.2 - Introduction⁶

a. Idea 1, m. 1

marimba

[♩ = 120] con bravura
(relentlessly with energy and intensity)

*1)

p sub. *2)

p

b. Idea 2, m. 4

prorompente

sub.

c. Idea 3, m. 7

*3) legato

pp sub.

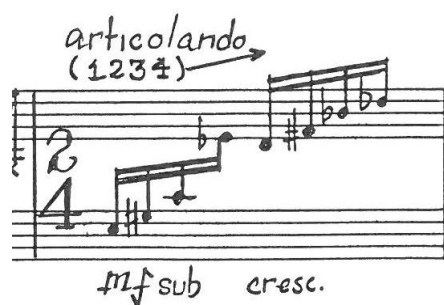
⁵ Fang, "The 1986 National Endowment," 40.

⁶ Joseph Schwantner, *Velocities*.

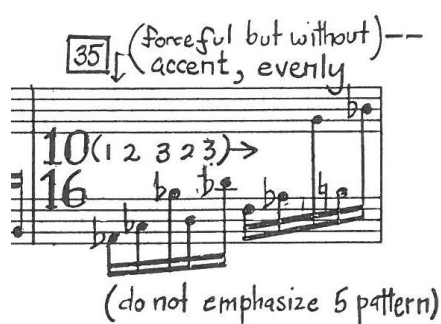
This section introduces the main rhythmic, textural, timbral, and pitch-related elements of the composition. The extended technique of playing on the edge of the bars with the wooden shafts of the mallets is notated as “x” and used in the first measure of the piece. This creates an abrupt change in timbre.⁷ The primary motivic content of section A is derived from idea 4 (Example 3.3).

Example 3.3 - Section A, Idea 4 and its variations

a. m. 29



b. m. 35



c. m. 39



A cascading fourth pattern (idea 5) is used for connecting different thematic ideas (Example 3.4)

⁷ Fang, "The 1986 National Endowment," 54.

Example 3.4 - Idea 5

a. Idea 5, m. 31-32, connection to idea 3

Handwritten musical notation for Example 3.4, part a. The notation shows two staves. The first staff is in treble clef with a key signature of two flats and a 12/16 time signature. It contains a melodic line with a 4-measure rest, followed by a 3-measure rest, and then a 4-measure rest. The second staff is in bass clef with a key signature of two flats and a 4/8 time signature. It contains a melodic line with a 4-measure rest, followed by a 3-measure rest, and then a 4-measure rest. Handwritten notes include "con forza e marcatiss" and "aspero". Fingering numbers 1, 2, 2, 2 are written below the second staff. A "cresc." marking is present below the first staff.

b. m. 47-48, connection to section B

Handwritten musical notation for Example 3.4, part b. The notation shows two staves. The first staff is in treble clef with a key signature of two flats and a 12/16 time signature. It contains a melodic line with a 4-measure rest, followed by a 3-measure rest, and then a 4-measure rest. The second staff is in bass clef with a key signature of two flats and a 7/8 time signature. It contains a melodic line with a 4-measure rest, followed by a 3-measure rest, and then a 4-measure rest. Handwritten notes include "Prorompendo", "legatiss.", and "sub dim sub.". Fingering numbers 1, 2, (2) are written below the second staff.

Idea 6 serves as the motivic basis for the B section along with a return of idea 3 with variations.

Example 3.5 - Section B

a. Idea 6, m. 48

Handwritten musical notation for Example 3.5, part a. The notation shows a single staff in treble clef with a key signature of two flats and a 7/8 time signature. It contains a melodic line with a 4-measure rest, followed by a 3-measure rest, and then a 4-measure rest. Handwritten notes include "legatiss." and "sub dim sub.". Fingering numbers 1, 2, (2) are written below the staff.

b. m. 52

Handwritten musical notation for Example 3.5, part b. The notation shows a single staff in treble clef with a key signature of two flats and a 7/8 time signature. It contains a melodic line with a 4-measure rest, followed by a 3-measure rest, and then a 4-measure rest. Handwritten notes include "(organ-like) resonant", "pp", "poco", and "p sub". Fingering numbers 1, 2, (2) are written below the staff.

c. Idea 3. m. 67

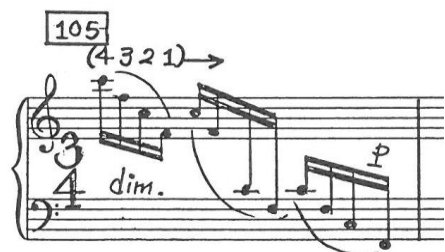


Schwantner's use of intervals is extraordinary. As seen in Example 3.2 a (Idea 1), the piece starts the intervals of a perfect fourth and major seventh. He uses these intervals throughout the piece, such as the first four notes of the theme in section B (Example 3.5 a, m. 48).

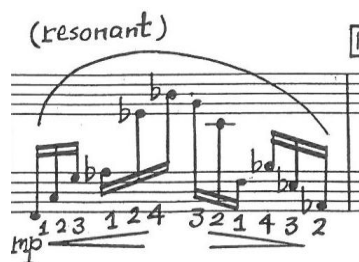
At measure 105 (see Example 3.6 a below), the introductory intervals of a perfect fourth and major seventh are inverted to a perfect fifth and minor second. This transformation of the introduction affects a transition into the C section while reaffirming the intervallic cohesion of the piece. The thematic ideas of section C are all derived from these two new intervals.

Example 3.6 - Section C

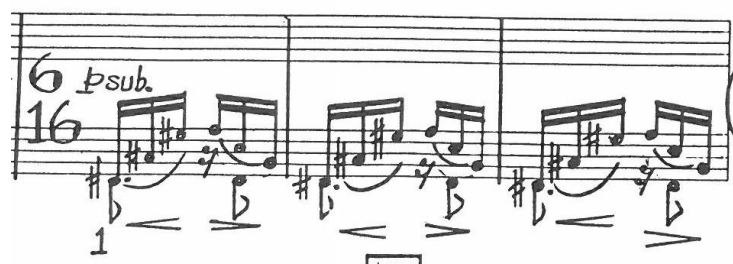
a. m. 105



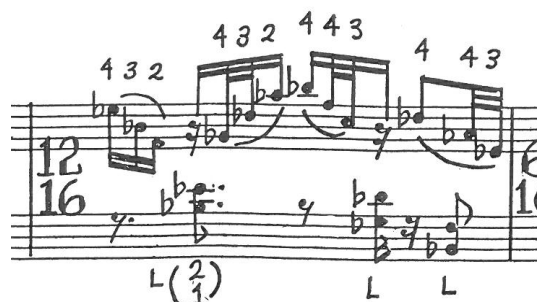
b. m. 142



c. m. 122-125



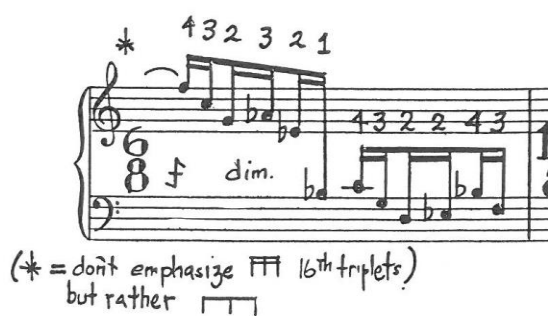
d. m. 177



Along with the changing meter, Schwanter also creates different senses of metrical division by using polyrhythm. For example, in m. 67 (see Example 3.5 c), the left hand plays a triple pattern while the right hand plays duple divisions. At m. 122 (see Example 3.6 c), the left hand creates a feeling of 3/8 meter, even though the music is written in 6/16. He also creates different metrical divisions by varying the phrasing. The cascading fourth pattern written in 12/16 in Example 3.4 a and b is augmented as 6/8 in m. 151, 153 and 234 (see Example 3.7 below).

Example 3.7

a. m. 151



b. m. 234



A remarkable aspect of *Velocities* is the variety of color and character changes within the constant sixteenth-note pattern. Schwanter achieves this effect through constant shifts of meter,

pitch sets and dynamics. Although the piece has a sense of unity - there are no rests or changes of tempo - the elements within it are juxtaposed so as to create a constant fluctuation feeling.

Schwantner has stated that *Velocities* is a chordal piece written largely in a single line. The harmony can only be heard in *Velocities* when the notes are played very quickly to create the illusion of the chords. He said, “I achieve harmony and harmonic progression through fast articulation of the notes played one at a time.”⁸

Challenges of the piece

One of the challenges in this piece is the physical and mental endurance it demands. As the title, *Velocities*, and subtitle, *Moto Perpetuo* (Perpetual Motion) suggest, this piece consists of constant sixteenth notes at a fast tempo without any rests. Not only is it technically difficult, it is physically and mentally exhausting. Performers commonly run out of energy even before the coda, which consists of thirty-eight measures of accented notes played *fff* and *ffff*, and they must play “as fast as possible” for the last thirteen measures. The coda comes after about eight minutes of constant motion. Physical fitness is an essential part of preparation, so that the performer will be able to finish convincingly without stopping for any reason. However, the conditions leading to a performer stopping are more likely mental. A mistake or lapse in memory might cause any performer who is not confident with the entire piece to lag or completely stop in order to find their bearings.

Because of the technical and physical demands, for example the leaps in register, the incessant nature of a “perpetual motion” that forbids page turns, and the general need to focus on pitches, many performers decide to memorize the piece. While memorization itself is a challenge for many, aspects of this piece make memorization even more difficult: the great length of a

⁸ Fang, “The 1986 National Endowment,” 66.

piece that does not stop, and the similarities between various passages that might cause a performer to jump to the wrong phrase. Furthermore, the aggression and athleticism inherent in the piece lead many players to interpret in a very vertical way, completely focused on the technical aspects. The most challenge demand of *Velocities* is in performing in a musical and meaningful way despite the technique and without destroying the forward momentum.

Preparation strategies

It is natural for people to think that the first task for learning a piece is to master the notes. The most common mistake people make is that they jump straight to cramming the notes into their memory from top to bottom. This is the least efficient way of leaning a piece, especially *Velocities*. Not only does it require enormous effort to memorize random notes, but it also increases the possibility of learning wrong notes and sticking.

Schwantner uses nine main thematic ideas; Example 3.8 below shows how each is distributed throughout the piece. These ideas are transposed into different keys/pitch sets with altered rhythmic profiles when they return in different sections. One good way to prepare is to practice each idea separately. This allows the player to shorten the process of learning notes, recognize patterns quickly, and to understand the topography and cohesiveness of the piece. This can also help with mental organization.

Example 3.8 – Distribution of nine thematic ideas

Section	Ideas	Measure #
Intro	Idea 1	1-3, 17-19, 23-24
	Idea 2	4-6, 15-16, 20
	Idea 3	7-14, 25-28
A	Idea 3	32-34, 38, 43-46
	Idea 4 and variations	29-30, 35-36, 39-40
	Idea 5	31, 37, 47
B	Idea 5	82-86
	Idea 6	48-51, 58-65, 68-75, 78-81, 97, 99, 101, 103
	Idea 3 and variations	66-67, 76-77, 87-96, 98, 100, 102, 104
	Idea 7	83-86
C	Idea 5	105-113, 119-121, 138-142, 150-153, 166-172, 205-209
	Idea 8	114-118, 142-146, 184-188
	Idea 9	122-137, 154-165, 173-183, 189-204
	Idea 3	147-149
B'	Idea 3	210, 213, 216, 219, 222-225, 230, 246-249, 255-264, 268-282
	Idea 5	234
	Idea 6	211-212, 214-215, 217-218, 220-221, 226-229, 231, 233, 265-267, 283-284
	Idea 7	235-242
A'	Idea 3	289-291, 295-296, 301-316
	Idea 4	286-187, 292-293, 297-300
	Idea 5	288, 294
Coda	Idea 1	317-340
	Idea 2	344-157
	Idea 5	342-343

Developing refined muscle memory is necessary to play *Velocities* because of the fast tempo, sudden register changes and quick shifts of mallet angles with difficult hand positions. This can be achieved by very slow repetition, using both conscious and subconscious practice. It is also very important to develop conscious explicit (declarative) memory as this piece requires a lot of memory retrieval for very complicated physical motions. The mental map is a great source for developing explicit memory. It is also useful to incorporate cognitive-based practice, such as practicing without an instrument while listening to a recording and anticipating the section that is coming up, or by visualizing the keyboard and “playing” in your head.

Cognitive-based practice will help the performer to manage playing without stopping. Practicing getting back on track after making a mistake is better than having multiple, meaningless run-throughs. Even if the performer messes up for a section, if he or she is aware of upcoming section, he or she can recover without having to stop. Players are required to focus on the moment and learn to push through mistakes. Having focused run-throughs only once or twice per session using a recording device is a good way to develop the skill.

Many performers allow the technical aspects to overtake their piece, as if it were a reckless, aggressive piece. Though *Velocities* has forceful opening and ending, and it is *moto perpetuo*, this piece also contains a lot of lyrical aspect in its sonority and texture. Too much focus on technique will hinder the expression of this element. Resolving this issue requires both physical control and conceptualization of Schwantner's markings. Since *Velocities* requires a lot of stamina, it is necessary to develop muscle and endurance. The player should even consider adding an exercise regimen that involves running or weight training. Physical strength allows for better control of the technique and relaxation, which can visually reinforce the lyrical playing. Schwantner is also quite specific in his performance markings, such as *prorompendo* (burst), *tempestoso* (storm like), *brutal*, and *con forza e marcatissimo* (with strength and demarcation) for the loud motives in the introduction, and “(organ-like) resonant” , “wave-like” , or “legato (flowing)” for the contrasting lyrical section. Having a clear imagination in using Schwantner's performance markings will also help to show the contrast of different characters and timbres.

Depicting these characters requires careful sticking choices and tempo selection (which might be slightly slower than the marked tempo). It is common, but unadvisable to disregard the sticking provided in the music in favor of playing more comfortably. For example, at m. 67 (See Example 3.5 c), some people use 1423 to avoid crossing the sticks (traditionally, mallets are

numbered from left to right, 1234); however, the marked sticking is meant to articulate the important duple and triple groupings. Sticking should serve the musical characteristics (metric shift and polymeter) even if it becomes less idiomatic. These same considerations apply to tempo. Many people slow down when they reach the C section, mostly because it is technically challenging. However, this destroys Schwantner's intention of voicing different metric groupings within the ongoing flow of sixteenth notes. It is better to find an adequate tempo not so slow as to hinder the forward momentum, but also slow enough to make the middle section manageable. Even though the learning curve for *Velocities* is fairly steep, a performance with rhythmic drive and musical commitment is very exciting and rewarding for both the performer and the audience.

Chapter 4: *Psappha* by Iannis Xenakis

About the composer

Iannis Xenakis (1922-2001) was a Greek-French composer, architect and engineer. As a composer, he tended towards the avant-garde, making extensive use of mathematical theories and models in his compositions, such as game theory, set theory, stochastic processes, and sieve theory. He was also an important figure in the development of computer and electronic music.

Xenakis fought in the Democratic Army of Greece in the aftermath of World War II in his early twenties. He was forced to live as a refugee in France after escaping British prosecution in Greece. The guilt of leaving his home country became one of the reasons for Xenakis's devotion to his music. Much of Xenakis's music reflects the characteristics of Greek culture, such as elements of Greek folk music and ancient Greek theater, in contrast with his innovative and radical concepts of sonic construction (or "sound composition").

Xenakis taught at Indiana University in Bloomington from 1967-1972 and the Sorbonne in Paris from 1973-1989. He wrote majority of percussion solo and ensemble works during 1970s and 80s, including *Persephassa* (1969, for sextet), *Psappha* (1975, solo), *Pléiades* (1978, for sextet), *Okho* (1989, for trio), and *Rebonds* (1989, solo).¹

About the piece

Psappha is a solo piece for multiple percussion instruments, written in 1975. It was commissioned by the English Bach Festival and dedicated to the French percussionist, Sylvio Gualda. Gualda premiered *Psappha* at Round House, London on May 2, 1976.² The American

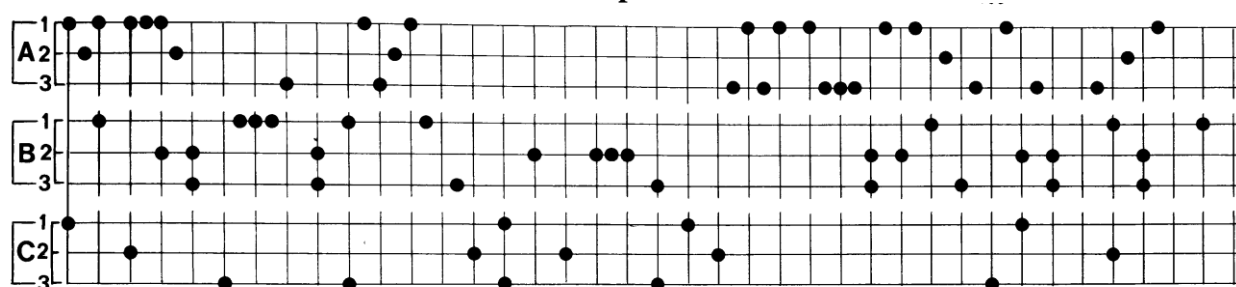
¹ Hoffmann Peter, "Xenakis, Iannis," *Grove Music Online*.

² Iannis Xenakis, *Psappha* (Paris: Editions Salabert, 1976), 1.

premiere took place in the contemporary festival “June in Buffalo” by David Knaack in the same year.

Psappha is an archaic form of the name Sappho, one of the Nine Lyric Poets of ancient Greece of the sixth century B.C., and the first person to introduce changes in the rhythmical patterns in her poetry. Xenakis used the iambic meter of Sappho’s poetry as a basic rhythmic structure of *Psappha*.³ Thus the primary thematic material is purely rhythmic. The score is written in unique graphic notation, which is read from left to right. The basic pulse is determined by the vertical lines. Notes to be played are shown by dots placed on those lines (Example 4.1).

Example 4.1



Xenakis utilizes sieve theory as a compositional basis for *Psappha*, in both the sonic events themselves and the ordering of those events within the piece. The theory of sieves is derived from the Sieve of Eratosthenes, which Xenakis encountered while researching the music of ancient cultures.⁴ Xenakis defines this algorithmic process of finding certain numbers in his book *Formalized Music* in terms of mathematical set theory.⁵ Previous works using the theory of sieves include *Nomos Alpha* (1966) for solo cello and *Persephassa* (1969) for six percussionists.⁶

³ Ellen Flint, "The Experience of Time and *Psappha*," *Presences de Iannis Xenakis* (2001): 166.

⁴ *Ibid.*, 4.

⁵ Barry Larkin, "Performance Analysis of *Psappha*," *Percussive Notes* (August 1992): 64

⁶ Flint, "The Experience of Time and *Psappha*," 4.

Challenges of the piece

One of the biggest challenges to performing *Psappha* is understanding the composer's language. *Psappha* is not comprised of any pitched materials. The harmonic analysis typical of marimba pieces does not apply here. Most people find performance difficult because of the lack of common musical materials, such as predictable harmonic progressions or any repetitions of idiomatic rhythmic patterns. Players might feel lost at first while they tackle the composer's completely different approach to musical construction. Analysis of the music takes an important role in overcoming this feeling and learning *Psappha*.

Reading unfamiliar notation is challenging. Xenakis uses a grid notation with dots that lacks a sense of meter. It is physically hard for the player's eyes to keep track of each line of the grid and follow the dense collection of dots. It is also not easy connecting each dot to the resulting sound. Each corresponds to a specific percussive timbre and not specific pitch. The actual pitches vary widely based on the performer's instrumentation choices, as well as factors such as the tightness of a drum head, which may change continually. A performer who is used to memorizing pieces by melodic content must now rely primarily on timbral content and contour, creating a much more tedious learning process.

The next challenge is the interpretation of the music, especially in a piece where mathematical theories are so significant. Considering the composer's mathematical intentions creates difficulty in determining which stylistic ideas, if any, are appropriate to a performance. Furthermore, Xenakis purposely avoids common musical notation, which necessarily influences not only the way the performer reads it, but also the way he or she interprets it. Moreover, the player determines both the instrumentation and the setup since Xenakis specifies neither in the score. Performers are required to find sounds that create sonic (melodic) sense in the piece. With

a massive setup of sixteen different instruments, the player's decisions about specific instruments and their placement have a major impact on not just the overall sound of the piece, but also the physical exertion in reaching all the instruments at the proper times. A setup that creates more physical ease in performance will allow greater room for the performer's more musical ideas.

Analysis of the piece






Psappha is written for six main families of instruments (A, B, C, D, E, and F). Each has three graduated subdivision except for group E, making for a total of sixteen instruments (see example 4.2 below). The instrumentation will be discussed in more detail below.

Example 4.2 - Instrumentation

A	B	C	D	E	F
123	123	123	123	1	123
High wood or skin	Medium wood or skin	Low wood or skin	Average metal	Neutral metal	Very high metal

Psappha consists of seven sections determined by changes of tempo, instrumentation, and sieve ideas (Example 4.3 below).

Example 4.3 - Sections

Section	Measure #	Tempo	Instrumentation	Sieve Idea	Function	
1a	1-518	Minimum 152	A, B	1 (B), 2 (A)	Intro	
1b	519-740	mm. 152	A, B, C	1 (B), 2 (A)		
2	740-990	mm. 272	A, B, C	1	Variation (imitation)	Development
3	990-1203	mm. 110	A1, B2, C3	1	Transition	
4a	1203-1410		A, B, C3, D, E	1,2,3	Chorus 1	
4b	1410-1538				Solo D & E	
4c	1539-1588				Solo A & B	
4d	1589-1720		Accel			
5a	1720-1850	mm. 134		3	Chorus 2 (piano)	
5b	1851-2023			3	Chorus 2 (forte)	
6	2023-2175			4	Chorus 3 Transition into finale (C3)	
7	2176-end			mm. 152	C3, F	

Four main sieve ideas and their variations are used. Examples of those ideas are shown below (Example 4.4). Idea 1 is a quarter-note figure (none of the notes sound in between the vertical lines of the score), whereas Idea 2 is an eighth-note figure (including subdivisions of the vertical lines into two parts). Idea 3 is a repeated eight note figure, and idea 4 is a variation of Idea 3. The two slashes indicate that each note is played with two or three hits.

Example 4.4 – Sieve ideas

The image displays four musical staves, each representing a different 'sieve idea'.
Idea 1: A single staff with a series of dots and stems, some with upward-pointing arrows.
Idea 2: A single staff with a series of dots and stems, some with upward-pointing arrows.
Idea 3: Two staves. The top staff has a series of dots. The bottom staff has a series of dots, some with upward-pointing arrows, and a dynamic marking *ff* (fortissimo).
Idea 4: Two staves. Both staves have a series of dots and stems, some with upward-pointing arrows.

The whole piece can be grouped into three main sections: introduction, development, and recapitulation, with gradual sense of expansion as a whole. As Example 4.3 shows, the overall density of instruments, tempo, and sieve idea increases as the piece progresses. Although the final section isolates only two instrumental groups, it still maintains maximum intensity, and creates a climactic ending.

Psappha may sound unorganized and random because it lacks the sense of meter and repetitive pattern; however, Xenakis's use of iambs from ancient Greek verse as a main rhythmic theme of the piece (*Psappha* theme) provides a degree of uniformity.

Example 4.5 – *Psappha* theme

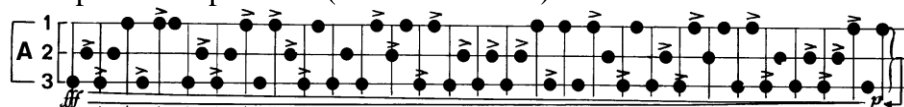
The image shows a musical staff labeled 'B2' with a series of dots and stems, some with upward-pointing arrows. A dynamic marking *f* (forte) is present at the beginning of the staff.

During the introduction, the *Psappha* theme occurs in the B2 line from the beginning to measure 39, with the values of sieve idea 1. Instrumental group A occasionally states a contrasting rhythmic pattern with sieve idea 2. At the end of section 1a, the group A takes over for group B, and states a solo passage from measure 380 to 518. In the development section, Xenakis uses fragments of the rhythmic patterns of group A, B and C consistently. In section two, the opening

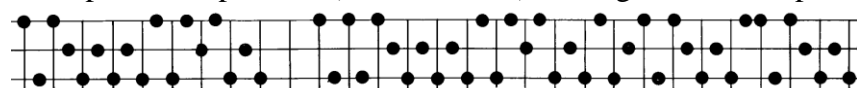
material of the Psappha theme is used in each group (A, B and C) with augmented values, and which enter fugally; this will be discussed in more detail below. In the recapitulation section, group F finally enters, restating the solo passage of group A from the introduction section (m.380-580) in retrograde, while C3 pattern of the previous section is retained (example 4.6). This retrograde of the earlier statement gives the audience the sense of recurrence, and it reconstructs the original series of event with new content.

Example 4.6

Excerpt of Group A solo (m. 380 - m. 518)



Excerpt of Group F solo (m. 2277 - end). Retrograde of Group A solo



Xenakis's use of time and space in the piece is remarkable. In addition to the four sieve ideas as an overall rhythmic scheme, Xenakis controls the independent horizontal lines of each voice. In *Psappha*, the higher pitched sounds play the faster figures and the lower ones move more slowly. Each voice has its own time scheme, which co-exists while also forming a composite time frame for the entire piece. Ellen Flint describes *Psappha* as "A multi-faceted aural presentation of the experience of time and of the psychoacoustic limits of the human perception of duration."⁷

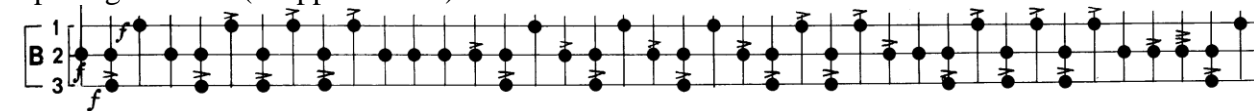
A significant example of this concept is shown in section two. At measure 740, the tempo suddenly changes from minimum of 152 to 272, and each instrumental group begins stating the

⁷ Flint, "The experience of the time and *Psappha*," 163.

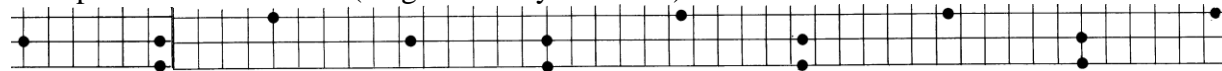
opening material of the Psappha theme in different augmented values (see Examples 4.7 below). Group C first enters at measure 745 with a direct quote from measure two through five. At measure 764, group C states the entire Psappha theme, augmented by 5.5 beats. Group A comes in next at measure 772 with the augmentation value of 2.5 beats. Finally, group B enters at measure 790 with the value of 3.5 beats. This creates the sense of three voice fugue with four different tempi occurring simultaneously: minimum 272, 108.8 (group A), 77.7 (group B) and 49.4 (group C).

Example 4.7 – Augmentation of Psappha theme

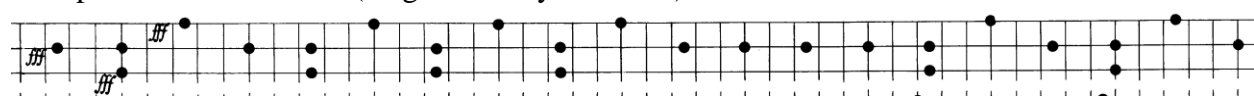
Opening material (Psappha theme)



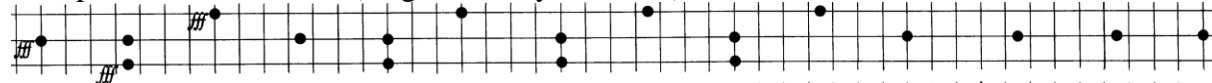
Group C entrance. m. 764 (Augmented by 5.5 beats)



Group A entrance. m. 772 (Augmented by 2.5 beats)



Group B entrance. m. 790 (Augmented by 3.5 beats)



Another example of the use of time and space occurs at the very end of the piece.

Xenakis uses a sieve based on the Fibonacci series in line C3 starting at measure 2252. He uses accents to emphasize the Fibonacci series: 0,1,3,5,8,13,21,34,55, 89 and 144.⁸ The space between accents gets wider and wider as the pattern progresses. This creates a sense of *ritardando* despite the relentless rhythmic vitality, while group F restates the opening material.

⁸ Flint, "The Experience of Time and *Psappha*," 169.

Instrumental choice

As shown in Example 4.2, Xenakis only specifies the category and relative frequency of the instruments, but the exact choice is left up to the performer. Xenakis specified to Gualda, the original performer, that he did not want conventional percussion timbres, such as tam-tam, marimba, vibraphone, etc. Rather, he wants sounds that are primitive and that can transmit nuanced colors without any connotations of particular cultures or times.⁹

My choice of the instruments is A (wood slats), B (congas), C (tom-toms and a concert bass drum), D (metal plates), E (skillet), and F (opera gongs). I also added a kick bass drum that is similar in sound to the concert bass drum in order to facilitate the denser sections of the piece, which already require a lot of arm movement. It is important to select instruments with timbres that are different enough to distinguish the identity of each group, because Xenakis treats each as an independent voice separate from any collective sound. Instruments with similar timbres will not reflect the polyphony in the rhythmic writing. In order to find “unfamiliar” sounds, I explored junk yards and played on different metals and woods. I ended up cutting metal plates and wood slats myself to find pitches that I wanted. I also considered how each group of instruments is used in each section of the piece. For example, group D first enters in the most lyrical and “melodic” section of the piece, in combination with groups A, B, C, and E. Yet, if the sonority of groups D and E are too sharp or ringing, they will easily overpower the other instruments and negate the lyrical quality. On the other hand, group F is only used to enhance the climactic ending in combination with instrument C3. This sound can be dissonant and brash, to propel the piece toward its climax.

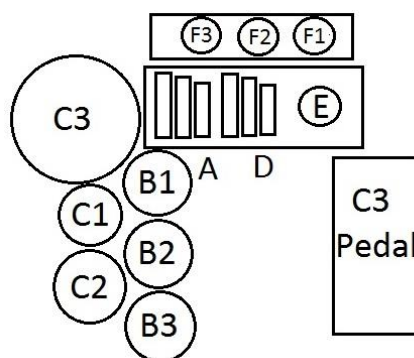
⁹ Sylvio Gualda “On *Psappha* and *Persephassa*,” in *Performing Xenakis (Iannis Xenakis Series)*, ed. Sharon Kanach (Hillsdale, N.Y.: Pendragon Press, 2010), 160.

Setup

After finding ideal sounds, players are required to devise a setup that allows for optimal execution. Practical considerations, such as mallet choice and space issues, are a major part of the decision making process in choosing a setup, yet they should not detract at all from the ideal sound if possible. During the densest section, the performer has to play eleven instruments at the same time, yet the space to fit these instruments is limited by the actual reach of the player, especially when the kick bass drum is involved, as he or she will lose mobility in order to maintain stable contact with the pedal.

I decided to assemble the instruments in a V-shape, with all skins on my left hand side, woods and metals on my right hand side and a bass drum in the middle. I put tom-toms (C1 and C2) and opera gongs (F) on the outer side of the V because they are only played for a limited time.

Example 4.8 - *Psappha* setup diagram



This way I can avoid crossing hands while playing all instruments of A, B, C3, D, E at the same time in section four through six. During the section, Xenakis assigns each sieve idea to the metal group and the skin group. This setup will allow each hand to perform different sieve ideas. Also,

it enables the performer to use different mallets for metals and skins. However, I decided to use hard plastic mallets wrapped with mole skin throughout the piece, so that I do not have to sacrifice the tempo of the piece by playing everything with one hand.

Notation

Xenakis's grid notation allows the player to clearly see the individual voicing of each instrumental group; however, it makes it harder to see the composite rhythm as a whole. It is also challenging to see the alignment of dots, especially when more instrumental groups are added. Furthermore, players are required to reorganize each line in their mind depending on the sticking. For example, with my setup, in order to play the section of Example 4.9 below, I need to use mainly my right hand to play group A, D and E and the left hand for group B and some of A. This offset alignment of instruments makes it even harder to read the notation.

Example 4.9

Many players may end up memorizing the piece by relying heavily on muscle memory, which may be easier than playing while reading. However, this kind of learning is not practical, because it only works if they use exactly the same instruments, setup, and sticking every time the work is

performed, and it is possible that these elements change depending on the situation. Furthermore, muscle memory is not always perfect, and so relying solely upon it is not a secure strategy.

Strategy of learning *Psappha*

My solution is to assign a syllable to each sound and rewrite the score by organizing the sounds. This approach is similar to that of Ayano Kataoka, a professor of University of Massachusetts at Amherst, in her teaching and performance of *Rebonds*, another percussion solo work by Xenakis.

Example 4.10- Assignment of syllables

A	B	C	D	E	F
123	123	123	123	1	123
Ki Ka Ko キカコ	Ta Te To タテト	Da De Do ダデド	Gi Ga Go ギガゴ	Chi チ	Ji Za Ge ジザゲ

I decided to use Japanese characters to notate the syllables because it is my first language, and it can be written with fewer letters than in English. My syllables mimic the actual sounds of the instrument, in enunciation simplistic form. This is my version of writing *Psappha*; the notation can be rewritten in whatever way makes the most sense to the performer. My version of the first seventeen measures from Example 4.9 is as follows:

Example 4.11 - First 17 measures of Example 4.9

	4	4	5	4
RH	ギゴギゴゴギゴゴ	キゴゴガギゴガチ	ガゴギギゴチゴガゴギ	ゴガチチゴガゴチ
LH	ト カ コ キ	ト ト タ ト	カコ キ ト キ	タ タ タ ト
	>	>	>	

The number above each box represents the number of beats within the line. The added bar lines do not necessarily imply mixed meter phrasings; they are used to find tracking points.

In this particular section, bar lines are used when the voicing of the group A and group B changes. The new notation is much simpler than the original, and it is easier to find the composite rhythm. It is also clear that right hand (metal group) is serving sieve idea 2 and left hand (skin group) is serving the sieve idea 1. The composite rhythm itself is fairly simple, as Xenakis only uses either quarter or eighth note figures in *Psappha*. Once the reading problem is solved, it is not hard to execute the rhythm. This eases the most of stress of learning *Psappha*.

Adding a syllable to each sound not only allows for linear notation without contour, but it also allows the player to have audible connection to the sound. This way, players can learn the piece by chanting the syllables like lyrics of a song. This helps to free the players from reliance on muscle memory and allows them to practice without the actual instruments. This kind of chanting practice is popular in Indian tabla, Balinese Kecak dance, and African drumming traditions. It is also a similar approach to solfège, but there is no pitch relation to the sound. This approach definitely allows for more efficient learning if players can apply the same techniques for learning melodic pieces to non-pitched ones. Singing also enhances player's musical intuition, and allows the performers to emotionally connect to the piece.

Rewriting this way also saves a lot of space of the score. The original score of *Psappha* is nine - 13x19. It is almost impossible to turn pages while playing because of the physical demands of the piece. Displaying multiple large pages in front of the setup will block the audience's view and inhibit the performer's physical movement if the score is not directly in front of the instruments that they are playing. This is another reason why most people decide to memorize the piece. The rewritten score can fit in the size of a small board, which is visually less distracting, and performers are not forced to memorize the piece.

When learning the piece, it is always important to refer to the original notation continually to make sure the performer is not losing the sense of Xenakis's multi-dimensional writing. The new notation helps the first time learners to executing the composite rhythm efficiently, but it is possible to lose the sense of multiple independent voice lines. It is also possible to misread some of the Xenakis's compositional intention. Having a deep understanding of the piece is essential before deciding to rescore the work.

Interpretation

Knowing the style of the music is important. Applying wrong style to any piece can easily ruin its whole effect. For *Psappha*, I continuously asked myself if the right approach involved applying common musical interpretations, such as phrasing, sense of meter, and fluctuating tempo and dynamics to such mathematical music. I feel that Xenakis consistently avoided those musical notions by using grid notation. Since the ideas were crafted from pure numbers, typical concepts of phrasing are not apparent.

However, it is clear that Xenakis created a new concept of time and space by using graphic notation. It is impossible to show multiple levels of tempo if he had used bar lines and fixed meters. The piece also has a clear construction of the basic form and sense of unfolding as a whole. There is certainly space for flexibility in the music, and places where the performer can add his or her own musical interpretation in order to depict those aspects more clearly to the audience.

In the end, it is essential to visualize bar lines and phrases in order to maintain the sense of direction. Without phrasing, both music and player get lost in the arithmetic. Practically speaking, it is also very difficult for the players to keep track of where they are without following the bigger pictures in their mind. Knowing that the piece is actually derived from Sappho's

poetry, the performer must reflect the sense of iambic meter. As long as the player does not disturb the sense of stress and timing, or the complicated polymeter, he or she may add extra phrasing to the piece.

Xenakis actually uses intuitive approach when composing his music. During his interview with Simon Emmerson in 1976, he explains his compositional process as follows:

I do not start with a rhythmic cell and try to develop it, or an element and amplify it...the solution is not really calculated or computed, but is a thought-out intuitive approach to the rhythmic problem, but with all previous experience as an aid. What is obtained by calculation always has limits. It lacks inner life, unless very complicated techniques are used...I did not use a computing mind. Moreover, it is a reaction to many aspects of contemporary percussion, which gives us so many timbres... Intuition together with experience creates new ideas. So I can't explain exactly everything that happens in the score.¹⁰

Xenakis's music is affective, even though it might first look dry and mathematical. Many people hear *Psappha* as an emotional and tragic piece. His music often conveys emotion through loud dynamics, dense accents, clusters of sound and dissonance. Xenakis also refers to Greek tragedy. Xenakis states, "I didn't want to imitate ancient Greek Music, which is unknown, apart from the scale of Aristoxenus. Through the music, I wanted to become part of, to enter the realm of the ancient Greek spirit. This is why I wrote the music."¹¹ The music of Xenakis is alive with this dramatic spirit, and musician should consider issues of interpretation in order to realize the ancient Greek plays of Xenakis's imagination.

¹⁰ Larkin, "Performance Analysis of *Psappha*." 1.

¹¹ Efi Xirou, "Charisma X," *Xenakis Edition Volume 12*, Vox Documentary and ERT 2008, DVD.

Conclusion

The most successful preparation strategies incorporate a good balance between physical and mental approaches. Physical training—even a daily exercise regimen—is good for pieces like *Velocities* and *Psappha* that demand physical strength, endurance, and control. Inadequate physical preparation might lead to serious injury while straining to perform. The physical strength is then refined in the practice room into the accurate muscle memory necessary for large percussion instruments and setups. Slow repetitions aid in this refinement, which in turn yield better note accuracy and execution of fast and complicated passages, but only when the player applies appropriate conscious and subconscious strategies. Mental training using cognitive approaches, such as analyzing pieces, making a mental map, visualization, and anticipation, develop explicit (declarative) memory that helps in retrieving muscle memory. The analytical approach is used to understand the harmonies in Bach's Allemande, distinguish different thematic ideas in *Velocities*, and knowing the important sieve ideas in *Psappha*. A full understanding of this approach vastly improves the performer's sense of interpretation. Once the performer has realized all of these strategies, and seen how each can improve the next, he or she can let go of them, trust in their preparation, and focus on the more important objective: the music itself.

All of the skills and strategies are interconnected, and there is no single process that works for every musical example. However, the percussionist who considers performing from every angle, physical and mental, will be more successful in playing convincingly under pressure. Furthermore, each skill that is gained while working on different pieces can be transferred to other areas of percussion playing and will advance the performer's overall musicianship. The music-making process is endless, and it will always involve the pressure of performing in the

spotlight. Yet, that time in the spotlight brings the gratifying opportunity to share with an audience. That is one of the most important things that makes music alive. If the performer can embrace all aspects of the music, and be technically, physically and mentally ready to play, he or she will reach optimal performance levels with inclusive knowledge, skill, and appreciation of the music.

Bibliography

- Ariza, Christopher. "The Xenakis Sieve as Object: A New Model and a Complete Implementation." *Computer Music Journal* 2 (Summer 2005): 40-60.
- Bois, Mario. *Iannis Xenakis, the Man and His Music; a Conversation with the Composer and a Description of His Works*. London: Boosey & Hawkes, 1967.
- Boyden, David D, Stowell, Robin, Chambers, Mark, James, Tyler, and Partridge Richard. "Scordatura." *Grove Music Online*. *Oxford Music Online*. Oxford University Press, accessed November 24, 2014, <http://www.oxfordmusiconline.com/subscriber/article/grove/music/41698>.
- "Brawl in the Concert Hall." *ESPN* video (October 31, 2014) <http://espn.go.com/video/clip?id=11798208>.
- Burritt, Thomas. "John Serry's *Rhapsody for Marimba, Night Rhapsody*, and Joseph Schwantner's *Velocities*. A Performer's Analysis." DMA diss., Northwestern University, 1999.
- Buyer, Paul. "Mental Training in Percussion." *Percussive Notes*. (April 2009): 35-37.
- Coffee, Pete, Tim Rees, and S. Alexander Haslam. "Bouncing Back from Failure: The Interactive Impact of Perceived Controllability and Stability on Self-Efficacy Beliefs and Future Task Performance." *Journal of Sports Sciences* 27, no. 11 (2009): 1117-24.
- Curtis, Kathleen A. *Physical Therapy Professional Foundations: Keys to Success in School and Career*. Thorofare, NJ: Slack, 2002.
- Donington, Robert. *The Interpretation of Early Music*. New rev. ed. New York: Norton, 1992.
- Duffie, Bruce. "An Interview with Iannis Xenakis." *Sonus* 2 (2008): 52-66.
- Dunkel, Stuart Edward. *The audition process: anxiety management and coping strategies*. Stuyvesant, NY: Pendragon Press, 1989.
- Fang, I-Jen. "The 1986 National Endowment For The Arts Commission: An Introspective Analysis of Two Marimba Works, *Reflections on The Nature of Water* by Jacob Druckman and *Velocities* by Joseph Schwantner, Together with Three Recitals of Selected Works by Keiko Abe, Christopher Deane, Peter Klatzow, Wayne Siegel, Gitta Steiner, and Others." DMA diss., University of North Texas, 2005.
- Fischer, Simon. "Mental Rehearsal." *Strad* 119, no. 1417 (2008): 82-83.
- Flint, Ellen. "The Experience of Time and Psaphha." *Presences de Iannis Xenakis*. (2001): 163-172.

- _____. "An Investigation of real time as evidenced by the structural and formal multiplicities in Iannis Xenakis's *Psappha*." PhD diss., University of Maryland at College Park, 1989.
- Freymuth, Malva. "Mental Practice: Some Guidelines for Musicians." *American Music Teacher* 43, no.5 (April/May 1994):18-21.
- Gallwey, W. Timothy. *The Inner Game of Tennis*. Rev. ed. New York: Random House, 1997.
- Geukes, Katharina, Christopher Mesagno, Stephanie J. Hanrahan, and Michael Kellmann. "Performing under Pressure in Private: Activation of Self-Focus Traits." *International Journal of Sport & Exercise Psychology* 11, no. 1 (2013): 11-23.
- Gibson, Benoît. *The Instrumental Music of Iannis Xenakis: Theory, Practice, Self-Borrowing*. Iannis Xenakis Series. Hillsdale, NY: Pendragon Press, 2011.
- _____. "Theory of Groups: In Search of a Method to Analyze Group Structures in the Music of Xenakis." *Contemporary Music Review* (November 2002): 45-52.
- Gordon, Stewart. *Mastering the Art of Performance: a Primer for Musicians*. Oxford: Oxford University Press, 2006.
- Green, Barry, and W. Timothy Gallwey. *The Inner Game of Music*. Garden City, N.Y.: Anchor Press/Doubleday, 1986.
- Grove, Robin, Catherine J. Stevens, and Shirley McKechnie. *Thinking in four dimensions: creativity and cognition in contemporary dance*. Carlton, Vic.: Melbourne University Press, 2005.
- Gruson, Linda M. "Rehearsal Skill and Musical Competence: Does Practice Make Perfect?" In *Generative Processes in Music: The Psychology of Performance, Improvisation, and Composition*, edited by John A. Sloboda. Oxford: Clarendon Press, 1988.
- Gualda, Sylvio. "On *Psappha* and *Persephassa*." In *Performing Xenakis (Iannis Xenakis Series)*, edited by Sharon Kanach. Hillsdale, N.Y.: Pendragon Press, 2010.
- Gucciardi, Daniel F., Jay-Lee Longbottom, Ben Jackson, and James A. Dimmock. "Experienced Golfers' Perspectives on Choking under Pressure." *Journal of Sport & Exercise Psychology* 32, no. 1 (2010): 61-83.
- Hamburg, Jeannine W. *Where is that music coming from? A path to creativity*. Cherry Hill, NJ: Myrte Press, 1989.
- Harley, James. *Xenakis: His Life in Music*. New York: Routledge, 2004.
- Hiatt, James S., and Sam Cross. "Teaching and Using Audiation in Classroom Instruction and Applied Lessons with Advanced Students." *Music Educators Journal* 92, no. 5 (2006): 46-49.

- Hodges, Donald. "Implications of Music and Brain Research." *Music Educators Journal* 87, no.2 (2000): 17-23.
- Hoffmann, Peter. "Xenakis, Iannis." *Grove Music Online*. Oxford Music Online. Oxford University Press, accessed November 25, 2014, <http://www.oxfordmusiconline.com.www2.lib.ku.edu/subscriber/article/grove/music/30654>.
- Hochreither, Karl, and Melvin P. Unger. *Performance practice of the instrumental-vocal works of Johann Sebastian Bach*. Lanham, Md.: Scarecrow Press, 2002.
- Hunt, Maria, and Shirlene Hess. *Avila University's Mindful Wellness Self-Study Workbook*. Kansas City: Avila University Press, 2011.
- Jordan-Miller, Rebekah. "Mental Skills Training For a Lower-Advanced To Advanced Pianist." DMA diss., University of Oklahoma, 2010.
- Kalat, James W. *Biological psychology* 9th ed. Belmont, CA: Thomson/Wadsworth, 2007.
- Kanach, Sharon E. *Performing Xenakis*. Iannis Xenakis Series. Hillsdale, N.Y.: Pendragon Press, 2010.
- Khasky, A. D. and J.C. Smith. "Stress, Relaxation States, and Creativity." *Perceptual and Motor Skills* 88, no.2 (1999): 409-416.
- Klickstein, Gerald. *The musician's way: a guide to practice, performance, and wellness*. Oxford: Oxford University Press, 2009.
- Kodama, Mitsuo. *Graphic Explanation of Excellent Concentration (in Japanese)*. Tokyo: Narumido Shyuppan, 2012.
- Kozuma, Youichi. *Mental Training for Basketball Players (in Japanese)*. Tokyo: Bassball Magazine Japan, 2010.
- Kriegel, Robert J., and Marilyn Harris Kriegel. *The C Zone: Peak Performance under Pressure*. 1st ed. Garden City, N.Y.: Anchor Press/Doubleday, 1984.
- Larkin, Barry. "Performance Analysis of Psappha." *Percussive Notes* 30 (August 1992): 64-68.
- Lehmann, Andreas C., and K. Anders Ericsson. "Research on Expert Performance and Deliberate Practice: Implications for the Education of Amateur Musicians and Music Students." *Psychomusicology: A Journal of Research in Music Cognition* 16, no. 1-2 (1997): 40-58.
- Likar, Amy. "Performance Anxiety: A Resource Guide." *Flutist Quarterly - The Official Magazine of the National Flute Association* 34, no. 3 (Spring 2009): 32-36.

- Little, Meredith, and Natalie Jenne. *Dance and the music of J.S. Bach*. Expanded ed. Bloomington: Indiana University Press, 2001.
- Matossian, Nouritza. *Xenakis*. London, New York: Kahn & Averill; Taplinger Pub. Co., 1986.
- McHugh-Grifa, Abigail. "A Comparative Investigation of Mental Practice Strategies Used by Collegiate-Level Cello Students." *Contributions to Music Education* 38, no. 1 (2011): 65-79.
- Mesagno, Christopher, Daryl Marchant, and Tony Morris. "A Pre-Performance Routine to Alleviate Choking in 'Choking-Susceptible' Athletes." *Sport Psychologist* 22, no. 4 (2008): 439-57.
- Mishra, Jennifer. "Context-Dependent Memory: Implications for Musical Performance." *Update Applications of Research in Music Education* 20, no.2 (2002): 27-31.
- Moore, Bill. *Playing Your Best When It Counts*. Norman, OK: Moore Performance Consulting, 2011.
- Morgan, Don. "Subconscious and Smartconscious Goals." In *Masters of Success: Proven Techniques for Achieving Success in Business and Life*, edited by Irvine and Don Morgan. Toronto, Canada: Entrepreneur Press, 2004.
- Muraki, Yukito. *Sport training theory (in Japanese)*. Tokyo: Dainipponinsatsu Kabushiki Gaisha, 1994.
- Neumann, Frederick. *Ornamentation in Baroque and Post-Baroque Music: With Special Emphasis on J. S. Bach*. Princeton: Princeton University Press, 1978.
- O'Connor, J. P. "When Pressure Meets Performance, Sometimes Athletes Choke: Part I of II: The Mechanisms." *Soccer Journal* 51, no. 5 (2006): 20-22.
- Orlick, Terry. *In Pursuit of Excellence: How to Win in Sport and Life through Mental Training*. 2nd ed. Champaign, IL: Leisure Press, 1990.
- Pancaroglu, Sirin. "The Teachers Forum: Mental Practice." *American Harp Journal* 20, no. 3 (Summer 2006): 58-59.
- Ravizza, Ken, and Tom Hanson. *Heads-up Baseball*. Translation rights Orion Literary Agency, Tokyo: Masters Press, 1995.
- Reed, Brett. "Building a Set of Sixxen." *Percussive Notes* 41 (June 2003): 48-50.
- Rink, John. "Analysis and (or?) Performance." In *Musical Performance a Guide to Understanding*. Cambridge: Cambridge University Press, 2002.

- Rosen, Michael. "Focus on Performance: An Interview with Sylvo Gualda Concerning *Psappha*." *Percussive Notes* 27 (Summer 1989): 32-36.
- Rosen, Michael. "Terms Used in Percussion." *Percussive Notes* 22 (July 1984): 75-76.
- Saeed, Sy A., Diana J. Antonacciand, and Richard M. Bloch. "Exercise, Yoga, and Meditation for Depressive and Anxiety Disorders." *American Family Physician* 81, no. 8 (2010), 981-986.
- Schmidt, Richard A. "Control Processes in Motor Skills," *Exercise and Sport Science Reviews* 4 (1976): 229-261.
- _____ and Craig A. Wrisberg. *Motor Learning and Performance: a Situation-based Learning Approach*. 4th ed. Champaign, IL: Human Kinetics, 2008.
- Siblin, Eric. *The Cello Suites*. Crows Nest, N.S.W.: Allen & Unwin, 2009.
- Smend, Friedrich, and Stephen Daw. *Bach in Köln*. St. Louis, MO: Concordia Pub. House, 1985.
- Solomons, Makis. "Xenakis's Thought through his Writings." *Journal of New Music Research* 2 (2004): 125-136.
- Varga, Bálint András. *Conversations with Iannis Xenakis*. London: Faber and Faber, 1996.
- Walls, Peter. "Historical Performance and the modern performer." In *Musical Performance a Guide to Understanding*, edited by John Rink. Cambridge: Cambridge University Press, 2002.
- Weinberg, Robert S., and Daniel Gould. *Foundations of Sport and Exercise Psychology*. 4th ed. Champaign, IL: Human Kinetics, 2007.
- Winold, Allen. *Bach's Cello Suites: Analyses and Explorations*. 2 vols. Bloomington: Indiana University Press, 2007.
- Xenakis, Iannis, and John Rahn. "Sieves." *Perspective of New Music* 1 (Winter 1990): 58-78.
- Xirou, Efi. "Charisma X." *Xenakis Edition Volume 12*. Vox Documentary and ERT 2008. DVD

Musical Scores

- Bach, Johann Sebastian. "Suite in G minor, BWV 995." In *Pièces pour la Luth à Monsieur Schouster*. Bibliothèque Royale de Belgique. Brussels, Belgium, F2910.
- Bach, Johann Sebastian. "Suite No.5 in C minor, S.1001." In *Six Suites for Cello Solo*, edited by

Pierre Fournier. New York: International Music Company, 1972: 28-29.

Bach, Johann Sebastian. "Suite No.5 in C minor." In *Suonaten Pour le Viola da Basso*, copied by Johann Peter Kellner. Manuscript, n.d. (ca.1726). Kassel: Bärenreiter No.5215/5216, 2000: 268.

Schwantner, Joseph. *Velocities (Moto Perpetuo)*. New York: Helicon Music Corporation, 1991.

Xenakis, Iannis. *Psappha*. Paris: Editions Salaber, 1976.